

Claims

We claim:

1. An isoquercitrin-enriched composition prepared by a process comprising:

providing a solution having rutin suspended therein at conditions suitable for enzyme incubation;

adding an enzyme preparation comprising naringinase to the solution;

maintaining the conditions of the solution suitable for enzyme incubation during an incubation period;

terminating the incubation period by changing the conditions of the solution to conditions unsuitable for said enzyme incubation;

wherein the proportion of isoquercitrin in the composition is controlled by adjusting the duration of the incubation period.
2. The isoquercitrin-enriched composition of Claim 1 wherein the composition is further enriched with quercetin as a result of the enzyme incubation.
3. The isoquercitrin-enriched composition of Claim 2 wherein the relative proportion of quercetin and isoquercitrin is controlled by adjusting the duration of the incubation period.
4. The isoquercitrin-enriched composition of Claim 2 wherein the duration of the incubation period is dependent on the activity of the enzyme preparation.

15. The isoquercitrin-enriched composition of Claim 1 wherein the rutin is obtained in enriched or purified form from a commercial source.
16. The isoquercitrin-enriched composition of Claim 1 wherein the rutin is obtained by the method of Claim 53.
17. An isoquercitrin-enriched composition containing isoquercitrin produced in accordance with the process of Claim 1, said composition having bioactive properties comprising angiotensin-converting enzyme inhibitory, anti-inflammatory, anti-tumor, anti-viral, anti-oxidative, free radical scavenging, cancer preventative, cardioprotective, proteinase-inhibitory, protein kinase C inhibitory, tyrosine protein kinase inhibitory, topoisomerase II inhibitory and protein-cleaving enzyme inhibitory properties.
18. The isoquercitrin-enriched composition of Claim 17, wherein the bioactive properties of said composition are used in the prevention and treatment of diseases and health problems, including, but not limited to cardiovascular disease, stroke, capillary fragility, arteriosclerosis, trauma, oxidative stress, hypertension, elevated cholesterol, elevated triglycerides, hyperglycemia, types II diabetes, obesity and related disorders, Alzheimer's disease, Parkinsonism, asthma and some cancers.
19. The isoquercitrin-enriched composition of Claim 17, wherein said composition is used in functional foods.
20. The isoquercitrin-enriched composition of Claim 17, wherein said composition is used in natural health products.
21. The isoquercitrin-enriched composition of Claim 17, wherein said composition is used in nutraceutical products.

27. The isoquercitrin-enriched composition of Claim 26 wherein said β -D-glucosidase inhibitor is added to the solution before the addition of said enzyme preparation to the solution
28. The isoquercitrin-enriched composition of Claim 26 wherein the β -D-glucosidase inhibitor has the properties of D- Δ -gluconolactone.
29. The isoquercitrin-enriched composition of Claim 28 wherein the β -D-glucosidase inhibitor is D- Δ -gluconolactone.
30. The isoquercitrin-enriched composition of Claim 24 wherein the enzyme preparation comprises α -L-rhamnosidase.
31. The isoquercitrin-enriched composition of Claim 24 wherein the conditions of the solution during enzyme incubation include temperature and pH level.
32. The isoquercitrin-enriched composition of Claim 31 wherein the temperature is in the range of 50 – 55°C.
33. The isoquercitrin-enriched composition of Claim 31 wherein the pH is in the range of 4 – 8.
34. The isoquercitrin-enriched composition of Claim 24 wherein the conditions of the solution during enzyme incubation includes the addition of a β -D-glucosidase inhibitor.
35. The isoquercitrin-enriched composition of Claim 34, wherein the β -D-glucosidase inhibitor has the properties of D- Δ -gluconolactone.
36. The isoquercitrin-enriched composition of Claim 25 wherein the β -D-glucosidase inhibitor is D- Δ -gluconolactone.

46. An isoquercitrin-enriched composition containing isoquercitrin produced in accordance with the process of Claim 1, said composition having bioactive properties comprising angiotensin-converting enzyme inhibitory, anti-inflammatory, anti-tumor, anti-viral, anti-oxidative, free radical scavenging, cancer preventative, cardioprotective, proteinase-inhibitory, protein kinase C inhibitory, tyrosine protein kinase inhibitory, topoisomerase II inhibitory and protein-cleaving enzyme inhibitory properties.
47. The isoquercitrin-enriched composition of Claim 46, wherein the bioactive properties of said composition are used in the prevention and treatment of diseases and health problems, including, but not limited to cardiovascular disease, stroke, capillary fragility, arteriosclerosis, trauma, oxidative stress, hypertension, elevated cholesterol, elevated triglycerides, hyperglycemia, types II diabetes, obesity and related disorders, Alzheimer's disease, Parkinsonism, asthma and some cancers.
48. The isoquercitrin-enriched composition of Claim 46, wherein said composition is used in functional foods.
49. The isoquercitrin-enriched composition of Claim 46, wherein said composition is used in natural health products.
50. The isoquercitrin-enriched composition of Claim 46, wherein said composition is used in nutraceutical products.
51. The isoquercitrin-enriched composition of Claim 46, wherein said composition is used in pharmaceutical products.
52. The isoquercitrin-enriched composition of Claim 46, wherein said composition is used in cosmetic products.

60. The process of Claim 59 wherein the aqueous solution has a concentration of between 50% and 100% alcohol by volume, and the balance of the solution is water.
61. The process of Claim 59 wherein the temperature of the aqueous solution is maintained at between 30°C and 99°C during the extraction process.
62. The process of Claim 53 wherein the plant biomass comprises biomass from a member of the genus of *Fargopyrum*.
63. The process of Claim 53 wherein the biomass comprises at least one of: leaves of St. John's Wort; ginkgo; biloba; alfalfa; mulberry; algae; apple peels; pear peels; onion skins; asparagus tips; and rose hip pericarps.
64. A flavonoid-enriched composition containing rutin produced in accordance with the process of Claim 53, said composition having bioactive properties comprising angiotensin-converting enzyme inhibitory, anti-inflammatory, anti-tumor, anti-viral, anti-oxidative, free radical scavenging, cancer preventative, cardioprotective, proteinase-inhibitory, protein kinase C inhibitory, tyrosine protein kinase inhibitory, topoisomerase II inhibitory and protein-cleaving enzyme inhibitory properties.
65. The flavonoid-enriched composition of Claim 64, wherein the bioactive properties of said composition are used in the prevention and treatment of diseases and health problems, including, but not limited to cardiovascular disease, stroke, capillary fragility, arteriosclerosis, trauma, oxidative stress, hypertension, elevated cholesterol, elevated triglycerides, hyperglycemia, types II diabetes, obesity and related disorders, Alzheimer's disease, Parkinsonism, asthma and some cancers.
66. The flavonoid-enriched composition of Claim 64, wherein said composition is used in functional foods.

72. The method of Claim 71 wherein said composition also contains quercetin as a result of said enzyme incubation.
73. The method of Claim 72 wherein the relative proportion of quercetin and isoquercitrin is controlled by adjusting the duration of the incubation period.
74. The method of Claim 71 wherein the duration of the incubation period is dependent on the activity of the enzyme preparation.
75. The method of Claim 71 wherein the duration of the incubation period is in the range of 1 – 48 hr.
76. The method of Claim 71 wherein the conditions of the solution during enzyme incubation include temperature and pH level.
77. The method of Claim 76 wherein the temperature is in the range of 50 – 55°C.
78. The method of Claim 76 wherein the pH is in the range of 4 – 8.
79. The method of Claim 71 wherein the conditions of solution are an acidic pH and a temperature of substantially 80°C.
80. The method of Claim 71 wherein the ratio of rutin to isoquercitrin is less than 20:1 by weight.
81. The method of Claim 80 wherein the ratio of quercetin to isoquercitrin is greater than 0.003:1 by weight.
82. The method of Claim 71 further comprising purification of said solution following termination of said incubation period.

89. The isoquercitrin-enriched composition of Claim 85, wherein said composition is used in nutraceutical products.
90. The isoquercitrin-enriched composition of Claim 85, wherein said composition is used in pharmaceutical products.
91. The isoquercitrin-enriched composition of Claim 85, wherein said composition is used in cosmetic products.
92. A method of producing an isoquercitrin-enriched composition, said method comprising:
- providing a solution having rutin suspended therein at conditions suitable for enzyme incubation;
- adding an enzyme preparation comprising naringinase to the solution;
- maintaining the conditions of the solution suitable for enzyme incubation during an incubation period;
- terminating the incubation period by changing the conditions of the solution to conditions unsuitable for enzyme incubation;
- wherein the proportion of isoquercitrin in the composition is controlled by adjusting the duration of the incubation period.
93. The method of Claim 92, wherein the yield of isoquercitrin is controlled by adjusting the duration of the incubation period.
94. The method of Claim 92, wherein the duration of the incubation period is in the range of 1 – 48 hr.

106. The method of Claim 105 wherein the concentration of D- Δ -gluconolactone is greater than 1 mM.
107. The method of Claim 92 further comprising terminating the incubation period by denaturing the enzyme α -L-rhamnosidase.
108. The method of Claim 92 wherein the ratio of rutin to isoquercitrin is less than 20:1 by weight.
109. The method of Claim 92 wherein the ratio of quercetin to isoquercitrin is greater than 0.003:1 by weight.
110. The method of Claim 92 further comprising purification of said solution following termination of said incubation period.
111. The method of Claim 110 wherein the purification of said solution following termination of said incubation period is conducted using conventional biochemical purification.
112. The product, purified isoquercitrin, produced in accordance with the method of Claim 111.
113. An isoquercitrin-enriched composition containing isoquercitrin produced in accordance with the process of Claim 92, said composition having bioactive properties comprising angiotensin-converting enzyme inhibitory, anti-inflammatory, anti-tumor, anti-viral, anti-oxidative, free radical scavenging, cancer preventative, cardioprotective, proteinase-inhibitory, protein kinase C inhibitory, tyrosine protein kinase inhibitory, topoisomerase II inhibitory and protein-cleaving enzyme inhibitory properties.